1. A company is currently using a single server, configured with multiple services, for its business operation. As the company is growing rapidly, a single server won’t not be sufficient and efficient for various business operations. Thus, you are assigned to design a new architecture of server and network implementation based on the following information.

* The company needs to process and produce a lot of documents. All versions of a document must be kept for references and accessible from all branches in various regions.
* Email is an important communication channel between company and clients as documents can be attached in an email. The company will not send or receive documents through fax.
* Information of employees, clients and projects must be kept.

1. Propose three types of servers that are suitable to be implemented.

file server for document

Mail server for email

Database server for info

1. There are a few new branches will be located in areas with slower internet connection speed. Suggest the type of client to be used in those branches with appropriate reasons.

Fat client has high processing load thus client only has minimal data to transfer from or tos erver

Thin client due to minimum processing on the client side

Fat client has high processing load, used in client/server model

Fat server has more function with higher lvl service. But easier to manage as only software on server need to change

1. Explain how the 3-tier architecture being beneficial to the company.
   1. First tier (client-tier) is to receive user events and to control the user interface and presentation of data.
      1. The client is called “Thin Client”. Browser and presentation code resides on this tier.
   2. Second tier (application-server-tier) contains complex application logic and available to the client tier on request from client. It can protect direct access of data.
   3. Third tier (database-server-tier) is responsible for data storage, mostly operates on a relational database.

2. There are 3 disks, namely D1, D2 and D3, configured as RAID 4, where D3 is the parity disk.

a. Suppose that a strip in D2 is updated. Explain how the new parity bit can be calculated. Show the relevant steps in your explanation.

To calculate parity bit: D3 = D1 D2 New parity bit: D3’ = D1 D2’ D3’ = D1 D2’ D2 D2 Reordering the terms: D3’ = D1 D2 D2 D2’ Replace first 2 terms: D3’ = D3 D2 D2’ To calculate new parity bit, old user strip and old parity strip need to be read in, and then updated.

b. Explain a possible performance issue in RAID 4.

Every write involves parity disk and causes a bottleneck

3. Calculate the parity bit for the following stripes in RAID 3.

Odd =1, even = 0

1. Disk 1: 10101, Disk 2: 01110, Disk 3: 10001

Parity bit : 01010

1. Disk 1: 010111, Disk 2: 111101, Disk 3: 101110, Disk 4: 101010

Parity bit: 101110

4. RAID 6 is able to regenerate data even 2 data disks failed. Explain how this feature is achieved in RAID 6.

RAID 6 uses 2 different parity calculations and stores the parity in separate blocks on different disks.

5. A company is planning to open a few more branches in various regions. Explain how client-server model can be beneficial to the company.

Relatively inexpensive, less complicated to implement, attractive GUI application

High maintenaince cost of app, app is bound to an individual pc, software distribution is complex, weak security

6. You decided to implement RAID-10 because of its high performance, however, it will increase the cost as more disks are required. Explain the concept and operation of RAID-10 to the management in order to gain support to implement it.

RAID-10 is a combination of RAID 0 and RAID 1 where RAID 1 is nested in RAID 0. Data are stripped across all disks (RAID 0), where strips on different disks can be access simultaneously. This will increase disk access performance. As a backup of data, each disk in RAID 0 has a mirror disk which contains duplicated data (RAID 1).